

算法研究

一种新的雷达辐射源信号识别方法研究

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摘要:

随着雷达技术的发展, 雷达体制的多样性和雷达信号的复杂性对雷达辐射源信号识别技术提出了严峻的挑战。循环双谱抗噪性能强, 且包含了丰富的信息, 能用于识别雷达辐射源信号。但是其数据量庞大, 而循环双谱对角切片法丢失了大部分信息。证明了循环双谱的对称性和周期性, 提出了局部轴向积分循环双谱。该方法首先计算信号的循环双谱, 然后在两个谱频率构成的平面上沿平行于谱频率轴的直线积分, 最后用Fisher判决率(FDR)选择鉴别能力较强的轴向积分循环双谱。这样不但能有效地减小数据量, 而且保留了大部分有用的循环双谱信息。仿真条件下, 对比分析了局部轴向积分循环双谱与循环双谱对角切片的识别效果, 结果表明新方法的识别率远远优于循环双谱对角切片法。

关键词: 循环双谱 轴向积分 雷达辐射源信号 分类识别 Fisher判决率

New Method for Radar Emitter Signal Recognition

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Abstract:

With the development of radar technology, the diversity of radar system and the complexity of radar signal posed a severe challenge to the radar emitter signal recognition techniques. Cyclic bispectrum could be used as a feature to recognize the radar emitter signal for its excellent properties such as noise immune and carrying abundant information, but it has large amount of data. The main dimension reduction method lost most of the information. The symmetry and periodicity of cyclic bispectrum was proved, and a new method of feature extraction called partial axially integral cyclic bispectrum was proposed in this article. First, the new method calculated the cyclic bispectrum of the signal. Second, for each cyclic frequency, integrated cyclic bispectrum along the linear parallel to frequency axis on the plane constituted by the two frequency spectrum, and then transformed it into a vector. Finally the fisher discriminant rate (FDR) was used to select the features which have stronger ability to identify different signals. The new method not only could reduce storage effectively, but also utilized most of the useful information of cyclic bispectrum. Under simulation conditions, the performance of partial axially integral cyclic bispectrum was compared with the diagonal slice method. The result shows that the performance of new method is far superior to diagonal slice method.

Keywords: cyclic bispectrum axially integral radar emitter signal recognition and classification fisher discriminant rate

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